12th St.

Brandywine Creek monitoring #2
June 2001 metals

ORIGINAL

Lockheed Martin Environmental Services
US EPA Environmental Science Center
701 Mapes Road Ft. Meade, MD 20755-5350
Telephone 410-305-3037 Facsimile 410-305-3597

LOCKHEED MARTIN

Michael Towle, 3HS31
USEPA Region 3
1650 Arch Street
Philadelphia, PA 19103-2029

July 3, 2001

Dear Michael,

Enclosed you will find the unvalidated Form I's and associated documents for SDG MC0J36 and MC0013 and MC0888, RAS case 29424, 12th Street Landfill site. Organic results will be forwarded upon receipt. Please contact ESAT's PO, Fredrick Foreman, at 410-305-2629, if ESAT can be of any further assistance.

Sincerely,

Karin E Hamburger

Karin E. Hamburger
ESAT RSCC

cc: Fred Foreman, ESAT PO

68-W-01-018
TDF: R064

USEPA Contract Laboratory Program
Inorganic Traffic Report

Case No:	29424
DAS No:	

R

Region:	3
Project Code:	07003
Account Code:	
CERCLIS ID:	
Spill ID:	D330
Site Name/State:	12th Street Landfill 6-18/DE
Project Leader:	Brian Croft
Action:	Removal Action
Sampling Co:	Tetra Tech EM Inc

Date Shipped:	6/18/2001
Carrier Name:	FedEx
Airbill:	825081938935
Shipped to:	Liberty Analytical 501 Madison Avenue Cary NC 27513 (919) 379-4080

Sampler (Signature): Brian S Croft

Relinquished By:	Date / Time:	Received By:
Relinquished By:	Date / Time:	Received By:
Relinquished By:	Date / Time:	Received By:

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE	STATION LOCATION	SAMPLE COLLECT DATE/TIME		ORGANIC SAMPLE No.	QC Type
MC0013	Surface Water/ Brian Croft	M/G	DM (14), TM (14)	1 (HNO3), 2 (HNO3) (2)	1 (downstream bank sar	6/18/2001	10:45		–
MC0014	Surface Water/ Brian Croft	M/G	DM (14), TM (14)	3 (HNO3), 4 (HNO3) (2)	2 (midstream bank sam	6/18/2001	10:55		–
MC0015	Surface Water/ Brian Croft	M/G	DM (14), TM (14)	5 (HNO3), 6 (HNO3) (2)	-3 (upstream bank sam	6/18/2001	11:05		–
MC0016	Surface Water/ Brian Croft	M/G	DM (14), TM (14)	7 (HNO3), 8 (HNO3) (2)	(middle of Brandywine (	6/18/2001	11:15		–
MC0017	~~Surface Water/~~ Brian Croft	M/G	DM (14), TM (14)	10 (HNO3), 9 (HNO3) (2)	SW-5 (field blank)	6/18/2001	10:30		–

Field QC

Shipment for Case Complete? Y	Sample(s) to be used for laboratory QC: MC0016	Additional Sampler Signature(s):	Chain of Custody Seal Number:
Analysis Key:	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Shipment Iced?_____
DM = CLP TAL Dissolved Metals, TM = CLP TAL Total Metals-water			

PR provides preliminary results. Requests for preliminary results will increase analytical costs.
Send Copy to: Contract Laboratory Analytical Services Support, 2000 Edmund Halley Dr., Reston, VA. 20191-3436 Phone 703/264-9348 Fax 703/264-9222

ORIGINAL

TR Number: 3-555513690-061801-0001

Tetra Tech EM Inc.

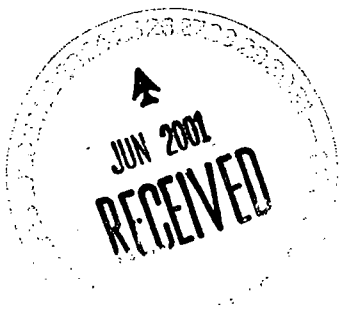
709 Chelsea Parkway ◆ Boothwyn, PA 19061 ◆ (610) 485-6410 ◆ FAX (610) 485-8587

ORIGINAL

PLEASE FILE WITH DATA PACKAGE

June 18, 2001

MEMO TO FILE
CASE 29424



RSCC
U.S. EPA Region III OAS/QA
Environmental Science Center
701 Mapes Road
Ft. Meade, MD 20755

Dear Ms. Jeffery:

This memo is written to correct the sample numbers for the dissolved metals on the Inorganic Traffic Report Chain of Custody Record number 3-555513690-061801-0001 and all tags and labels. The sampler assigned the same sample number to both the dissolved and total metals. The table below provides the corrected sample numbers for the dissolved metals for this case.

Correct CLP Sample Number	Assigned Sample Number	Tag Number
MC0018	MC0013	1
MC0019	MC0014	3
MC0020	MC0015	5
MC0021	MC0016	7
MC0022	MC0017	10

Please note these changes.

Sincerely,

Marian Murphy

Marian Murphy
For Sample Brian Croft

Attachment:

cc: EPA Michael Towle(3HS31)
START 3 TDD Files

ORIGINAL

CompuChem
a Division of Liberty Analytical Corp.
501 Madison Avenue Cary, NC 27513

SDG NARRATIVE
CASE # 29424 SDG # MC0013
CONTRACT # 68W00082

The indicated Sample Delivery Group (SDG) consisting of five (5) water samples was received into the laboratory information management system (LIMS) on June 19, 2001 intact and in good condition. Chains of Custody (COC) Records are in order, unless otherwise noted in any attachments or Quality Assurance Notices. Sample ID's reported in this data package are noted by the receiving department on the COC if they differ from those listed by the samplers on the COC.

The samples were analyzed, in accordance with EPA - CLP Statement of Work (SOW) document ILM04.1 for CLP TAL total metals.

The correlation coefficient for the mercury analytical run is confirmed to be $\geq$ 0.9950.

The cooler temperature bottle was present with samples received on June 19, 2001, and the sample temperature was 4 degrees Celsius.

EQUATIONS FOR WATER SAMPLE CALCULATIONS:

Client sample MC0016 is used for illustration.

Any sample result that is $\leq$ the instrument detection limit (IDL) will be entered at the IDL for that analyte.

ICP Equation:

$$\text{ICP analyte, ug/L} = \frac{A \times D \times F}{B}$$

Where: A = ug/L (ppb) ICP analyte of sample from analysis
B = Liter of original sample for digestion (0.050 L)
D = any dilution factor necessary to bracket sample value within standard values
F = final sample solution volume (0.050 L)

Example: $\frac{367.0738 \text{ ppb(Al)} \times 1 \times 0.050 \text{ L}}{0.050 \text{ L}} =$ 367.0738 ppb reported as 367 ug/L of Al

Mercury Equation:

$$\text{Hg, ug/L} = \frac{A \times D \times F}{B}$$

Where: A = ug/L (ppb) Hg of sample from analysis
B = Liter of original sample for digestion (0.10 L)
D = any dilution factor necessary to bracket sample value within standard values
F = final sample solution volume (0.10 L)

Example: $\frac{0.10 \text{ ppb}^* \times 1 \times 0.10 \text{ L}}{0.10 \text{ L}} = 0.10$ ppb reported as 0.10 ug/L* of Hg

* The result is reported down to the instrument detection limit.

SAMPLE IDs:

The following customer IDs are associated with this SDG:

MC0013 MC0014 MC0015 MC0016 MC0017

INSTRUMENTAL QUALITY CONTROL:

All calibration verification solutions (ICV & CCV), blanks (ICB, & CCB), and interference check samples (ICSA & ICSAB) associated with this data were confirmed to be within EPA CLP allowable limits.

SAMPLE PREPARATION QUALITY CONTROL:

The sample preparation procedure verifications (LCSW & PBW) were found to be within acceptable ranges and all field samples were prepared and analyzed within the contract specified holding times.

MATRIX RELATED QUALITY CONTROL:

The sample matrix spike, CCN = WG10969-1 (MC0016S) was found to be outside CLP control limits for silver. The reported concentrations for these analytes are flagged with an "N" on all associated Form 1 and on Form 5a.

An "N" indicates a matrix-related interference in the sample preparation procedure &/or analysis for the flagged analyte. This is normally the consequence of a relatively high anionic content in the sample or (for some sediments) an inconsistent sample matrix relative to that analyte.

CLP control limits for matrix spike recoveries are set at 75% to 125% of the analyte quantity added unless original sample concentrations exceed the true values of these "spikes" by a factor of four or more. In this case, affected analytes are not flagged even if recoveries are outside percentage recovery control limits.

Post-digestion spikes are mandatory for analytes demonstrating unsatisfactory matrix spike recoveries during ICP analysis (excluding silver). The results of such spikes are presented on Form 5b.

Unsatisfactory recovery of post-digestion spikes of this type do not have bearing upon the aforementioned "N" flags, but may indicate interference during analysis &/or a solution matrix which is hostile to the analyte in question.

Satisfactory recovery of an analyte in a post-digestion spike of this type implies interference by the required preparation procedure or in the sample matrix itself. Lack of uniformity for an analyte in sediments will also result in satisfactory recovery of post-digestion spikes after failure in the related matrix spike.

The sample matrix duplicate, CCN = WG10969-2 (MC0016D) was inside CLP control limits for the requested analytes.

CLP control limits for duplicate determinations are +/- 20% Relative Percent Difference (RPD) for concentrations greater than or equal to five times the CRDL in both the original and duplicate samples, and +/- the CRDL for concentrations less than five times the CRDL. The RPD is not calculated if both the original and duplicate values fall below the IDL.

A five-fold serial dilution of sample, CCN = MC0013-4 (MC0016L) was performed in accordance with CLP requirements for ICP analysis.

The adjusted sample concentrations were outside CLP control limits for barium and potassium, which are flagged with an "E" on all associated Form 1, the Cover Page and Form 9.

An "E" indicates that a chemical or physical interference effect was encountered during the analysis of the flagged analyte. As a result of this interference, all values for the analyte in the same matrix must be considered to be estimated quantities.

CLP control limits for serial dilution are defined as a deviation less than or equal to 10% in the dilution-adjusted concentrations from the original values for all analyte concentrations with values greater than fifty (50) times their respective Instrument Detection Limit (IDL) in the original sample.

The laboratory manager or his designee, as verified by the following signature has authorized release of the data contained in this hard copy data package.

Thomas R. Cole
Data Reviewer II
June 29, 2001

ORIGINAL

CompuChem
a Division of Liberty Analytical Corp.
501 Madison Avenue Cary, NC 27513

DATA REPORTING QUALIFIERS FOR INORGANICS

On Form I, under the column labeled "C" for concentration qualifier and "Q" for qualifier, each result is flagged with the specific data reporting qualifiers listed below, as appropriate. Up to five qualifiers may be reported on Form I for each analyte.

The C (concentration) qualifiers used are:

U: This flag indicates the analyte was analyzed for but not detected. This reported value was obtained from a reading that was less than the Instrument Detection Limit (IDL). The IDL will be adjusted to reflect any dilution and, for soils, the percent moisture.

B: This flag indicates the analyte was analyzed for and the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL) but greater than or equal to the Instrument Detection Limit (IDL).

The Q qualifiers used are:

E: This flag indicates an estimated value. This flag is used:

1. When the serial dilution (a five fold dilution for CLP and a five fold dilution for SW-846 method 6010B) results are not within 10%. The analyte concentration must be sufficiently high (minimally a factor of 50X above the IDL in the original sample).
2. When the analytical spike recovery associated with the sample is below 40% after two successive dilutions by Graphite Furnace Atomic Absorption (GFAA).

M: This flag applies to GFAA analyses for concentrations greater than the Contract Required Detection Limit (CRDL). This flag is only used for GFAA if the analytical sample or analytical spike duplicate injection reading is not within 20% of the Relative Standard Deviation (RSD).

N: This flag indicates the sample spike recovery is outside of control limits:

***:** This flag is used for duplicate analysis when the sample and the sample duplicate results are not within control limits.

S: This flag applies to GFAA analyses to indicate the reported value was determined by the Method Of Standard Addition (MSA).

W: This flag applies to GFAA analyses when the post-digestion spike (analytical spike) is out of control limits (85% - 115%), while sample absorbance is less than 50% of "spike" absorbance ["spike" is defined as (absorbance or concentration of spike sample) minus (absorbance or concentration of the sample)].

+: This flag applies to GFAA analyses when the correlation coefficient for the MSA is less than 0.995 after two MSA analyses.

NOTE: Entering "S", "W", or "+" is mutually exclusive. No combination of these qualifiers can appear in the same field for an analyte.

The extensions: D, S, SD, L. A, added to the end of the client ID represent as follows:

D:	matrix duplicate
S:	matrix spike
SD:	matrix spike duplicate
L:	serial dilution
A:	post digestion spike

Method Codes:

P:	ICP PLASMA
CV:	MERCURY COLD VAPOR AA
CA:	MIDI-DISTILLATION SPECTROPHOTOMETRIC
F:	FURNACE AA

U. S. EPA - CLP

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INORGANIC ANALYSIS DATA SHEET

ORIGINAL

EPA SAMPLE NO.

MC0013

Lab Name: COMPUCHEM Contract: 68W00082

Lab Code: LIBRTY Case No.: 29424 SAS No.: SDG No.: MC0013

Matrix (soil/water): WATER Lab Sample ID: MC0013-1

Level (low/med): LOW Date Received: 06/19/01

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	461			P
7440-36-0	Antimony	1.6	U		P
7440-38-2	Arsenic	2.1	U		P
7440-39-3	Barium	46.8	B	E	P
7440-41-7	Beryllium	0.40	U		P
7440-43-9	Cadmium	0.30	U		P
7440-70-2	Calcium	17800			P
7440-47-3	Chromium	1.7	B		P
7440-48-4	Cobalt	0.46	B		P
7440-50-8	Copper	3.8	B		P
7439-89-6	Iron	907			P
7439-92-1	Lead	3.8			P
7439-95-4	Magnesium	6420			P
7439-96-5	Manganese	97.4			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	2.2	B		P
7440-09-7	Potassium	2980	B	E	P
7782-49-2	Selenium	2.3	U		P
7440-22-4	Silver	0.70	U	N	P
7440-23-5	Sodium	12200			P
7440-28-0	Thallium	3.5	U		P
7440-62-2	Vanadium	3.1	B		P
7440-66-6	Zinc	5.5	B		P

Color Before: YELLOW Clarity Before: CLEAR Texture:

Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

U. S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

ORIGINAL

EPA SAMPLE NO.

MC0014

Lab Name: COMPUCHEM Contract: 68W00082

Lab Code: LIBRTY Case No.: 29424 SAS No.: SDG No.: MC0013

Matrix (soil/water): WATER Lab Sample ID: MC0013-2

Level (low/med): LOW Date Received: 06/19/01

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	344			P
7440-36-0	Antimony	1.6	U		P
7440-38-2	Arsenic	2.1	U		P
7440-39-3	Barium	48.0	B	E	P
7440-41-7	Beryllium	0.40	U		P
7440-43-9	Cadmium	0.30	U		P
7440-70-2	Calcium	19300			P
7440-47-3	Chromium	1.0	B		P
7440-48-4	Cobalt	0.30	U		P
7440-50-8	Copper	4.5	B		P
7439-89-6	Iron	796			P
7439-92-1	Lead	2.0	B		P
7439-95-4	Magnesium	6980			P
7439-96-5	Manganese	101			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	1.5	B		P
7440-09-7	Potassium	3040	B	E	P
7782-49-2	Selenium	2.3	U		P
7440-22-4	Silver	0.70	U	N	P
7440-23-5	Sodium	13100			P
7440-28-0	Thallium	3.5	U		P
7440-62-2	Vanadium	2.6	B		P
7440-66-6	Zinc	3.5	B		P

Color Before: YELLOW Clarity Before: CLEAR Texture:

Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

U. S. EPA - CLP

1

ORIGINAL

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MC0015

Lab Name: COMPUCHEM Contract: 68W00082

Lab Code: LIBRTY Case No.: 29424 SAS No.: SDG No.: MC0013

Matrix (soil/water): WATER Lab Sample ID: MC0013-3

Level (low/med): LOW Date Received: 06/19/01

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	530			P
7440-36-0	Antimony	1.6	U		P
7440-38-2	Arsenic	2.1	U		P
7440-39-3	Barium	48.2	B	E	P
7440-41-7	Beryllium	0.40	U		P
7440-43-9	Cadmium	0.30	U		P
7440-70-2	Calcium	18200			P
7440-47-3	Chromium	1.6	B		P
7440-48-4	Cobalt	0.30	U		P
7440-50-8	Copper	4.1	B		P
7439-89-6	Iron	1020			P
7439-92-1	Lead	3.2			P
7439-95-4	Magnesium	6660			P
7439-96-5	Manganese	97.4			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	1.3	B		P
7440-09-7	Potassium	3040	B	E	P
7782-49-2	Selenium	2.3	U		P
7440-22-4	Silver	0.70	U	N	P
7440-23-5	Sodium	12500			P
7440-28-0	Thallium	3.5	U		P
7440-62-2	Vanadium	3.1	B		P
7440-66-6	Zinc	7.3	B		P

Color Before: YELLOW Clarity Before: CLEAR Texture:

Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

U. S. EPA - CLP

1

ORIGINAL

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MC0016

Lab Name: COMPUCHEM Contract: 68W00082

Lab Code: LIBRTY Case No.: 29424 SAS No.: SDG No.: MC0013

Matrix (soil/water): WATER Lab Sample ID: MC0013-4

Level (low/med): LOW Date Received: 06/19/01

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	367			P
7440-36-0	Antimony	2.3	B		P
7440-38-2	Arsenic	2.1	U		P
7440-39-3	Barium	55.6	B	E	P
7440-41-7	Beryllium	0.40	U		P
7440-43-9	Cadmium	0.30	U		P
7440-70-2	Calcium	19800			P
7440-47-3	Chromium	1.7	B		P
7440-48-4	Cobalt	2.1	B		P
7440-50-8	Copper	4.6	B		P
7439-89-6	Iron	775			P
7439-92-1	Lead	1.0	B		P
7439-95-4	Magnesium	7290			P
7439-96-5	Manganese	102			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	3.2	B		P
7440-09-7	Potassium	2990	B	E	P
7782-49-2	Selenium	2.3	U		P
7440-22-4	Silver	0.70	U	N	P
7440-23-5	Sodium	13100			P
7440-28-0	Thallium	3.5	U		P
7440-62-2	Vanadium	4.5	B		P
7440-66-6	Zinc	3.2	B		P

Color Before: YELLOW Clarity Before: CLEAR Texture:

Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

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1

INORGANIC ANALYSIS DATA SHEET

ORIGINAL

EPA SAMPLE NO.

MC0017

Lab Name: COMPUCHEM Contract: 68W00082

Lab Code: LIBRTY Case No.: 29424 SAS No.: SDG No.: MC0013

Matrix (soil/water): WATER Lab Sample ID: MC0013-5

Level (low/med): LOW Date Received: 06/19/01

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	39.1	U		P
7440-36-0	Antimony	1.6	U		P
7440-38-2	Arsenic	2.1	U		P
7440-39-3	Barium	0.40	B	E	P
7440-41-7	Beryllium	0.40	U		P
7440-43-9	Cadmium	0.30	U		P
7440-70-2	Calcium	11.3	U		P
7440-47-3	Chromium	0.70	U		P
7440-48-4	Cobalt	0.30	U		P
7440-50-8	Copper	1.4	B		P
7439-89-6	Iron	12.4	U		P
7439-92-1	Lead	0.90	U		P
7439-95-4	Magnesium	24.3	B		P
7439-96-5	Manganese	0.15	B		P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	0.70	U		P
7440-09-7	Potassium	28.9	U	E	P
7782-49-2	Selenium	2.3	U		P
7440-22-4	Silver	0.70	U	N	P
7440-23-5	Sodium	166	U		P
7440-28-0	Thallium	3.5	U		P
7440-62-2	Vanadium	0.30	U		P
7440-66-6	Zinc	1.0	U		P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U. S. EPA - CLP

5A

SPIKE SAMPLE RECOVERY

ORIGINAL

EPA SAMPLE NO.

MC0016S

Lab Name: COMPUCHEM Contract: 68W00082

Lab Code: LIBRTY Case No.: 29424 SAS No.: _____ SDG NO.: MC0013

Matrix (soil/water): WATER Level (low/med): LOW

% Solids for Sample: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum	75 - 125	2535.2119		367.0738		2000.00	108.4		P
Antimony	75 - 125	571.6752		2.3408	B	500.00	113.9		P
Arsenic	75 - 125	43.6987		2.1000	U	40.00	109.2		P
Barium	75 - 125	2370.4570		55.5824	B	2000.00	115.7		P
Beryllium	75 - 125	54.0264		0.4000	U	50.00	108.0		P
Cadmium	75 - 125	54.7975		0.3000	U	50.00	109.6		P
Chromium	75 - 125	224.7472		1.7095	B	200.00	111.5		P
Cobalt	75 - 125	557.3181		2.1441	B	500.00	111.0		P
Copper	75 - 125	279.7348		4.6413	B	250.00	110.0		P
Iron	75 - 125	1847.5050		775.3967		1000.00	107.2		P
Lead	75 - 125	20.6517		1.0242	B	20.00	98.1		P
Manganese	75 - 125	660.5336		102.2136		500.00	111.7		P
Mercury	75 - 125	0.8560		0.1000	U	1.00	85.6		CV
Nickel	75 - 125	551.5142		3.2079	B	500.00	109.7		P
Selenium	75 - 125	8.8351		2.3000	U	10.00	88.4		P
Silver	75 - 125	30.6473		0.7000	U	50.00	61.3	N	P
Thallium	75 - 125	51.4979		3.5000	U	50.00	103.0		P
Vanadium	75 - 125	570.8516		4.4741	B	500.00	113.3		P
Zinc	75 - 125	558.2895		3.1552	B	500.00	111.0		P

Comments: _____

U. S. EPA - CLP

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DUPLICATES

ORIGINAL

EPA SAMPLE NO.

MC0016D

Lab Name: COMPUCHEM Contract: 68W00082

Lab Code: LIBRTY Case No.: 29424 SAS No.: SDG NO.: MC0013

Matrix (soil/water): WATER Level (low/med): LOW

% Solids for Sample: 0.0 % Solids for Duplicate: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Aluminum	200.0	367.0738		455.1694		21.4		P
Antimony		2.3408	B	1.6000	U	200.0		P
Arsenic		2.1000	U	2.1000	U			P
Barium		55.5825	B	47.6871	B	15.3		P
Beryllium		0.4000	U	0.4000	U			P
Cadmium		0.3000	U	0.3000	U			P
Calcium	5000.0	19857.3105		19374.4297		2.5		P
Chromium		1.7095	B	1.6098	B	6.0		P
Cobalt		2.1441	B	0.3552	B	143.2		P
Copper		4.6413	B	4.1363	B	11.5		P
Iron		775.3967		786.0359		1.4		P
Lead		1.0242	B	2.2124	B	73.4		P
Magnesium	5000.0	7287.3770		7124.9531		2.2		P
Manganese		102.2136		100.2751		1.9		P
Mercury		0.1000	U	0.1000	U			CV
Nickel		3.2079	B	1.7605	B	58.3		P
Potassium		2993.9331	B	2894.8340	B	3.4		P
Selenium		2.3000	U	2.3000	U			P
Silver		0.7000	U	0.7000	U			P
Sodium	5000.0	13109.2695		12895.0996		1.6		P
Thallium		3.5000	U	3.5000	U			P
Vanadium		4.4741	B	2.9250	B	41.9		P
Zinc		3.1552	B	5.5696	B	55.3		P

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LABORATORY CONTROL SAMPLE

Lab Name: COMPUCHEM Contract: 68W00082

Lab Code: LIBRTY Case No.: 29424 SAS No.: SDG NO.: MC0013

Solid LCS Source:

Aqueous LCS Source: HIPUR

Analyte	Aqueous (ug/L) True	Found	%R	Solid (mg/kg) True	Found	C	Limits		%R
Aluminum	20000.0	21008.42	105.0						
Antimony	6000.0	6611.83	110.2						
Arsenic	1000.0	1051.64	105.2						
Barium	20000.0	22026.35	110.1						
Beryllium	500.0	506.56	101.3						
Cadmium	500.0	507.58	101.5						
Calcium	50000.0	52576.07	105.2						
Chromium	1000.0	1046.02	104.6						
Cobalt	5000.0	5191.25	103.8						
Copper	2500.0	2645.70	105.8						
Iron	10000.0	10394.47	103.9						
Lead	300.0	300.18	100.1						
Magnesium	50000.0	52027.58	104.0						
Manganese	1500.0	1574.45	105.0						
Nickel	4000.0	4097.51	102.4						
Potassium	50000.0	51943.23	103.9						
Selenium	500.0	514.97	103.0						
Silver	1000.0	1077.98	107.8						
Sodium	50000.0	54365.56	108.7						
Thallium	1000.0	1021.74	102.2						
Vanadium	5000.0	5301.67	106.0						
Zinc	2000.0	2121.30	106.1						

CompuChem
a Division of Liberty Analytical Corp.
501 Madison Avenue Cary, NC 27513

SDG NARRATIVE
CASE # 29424 SDG # MC0J36
CONTRACT # 68W00082

The indicated Sample Delivery Group (SDG) consisting of five (5) dissolved water samples was received into the laboratory information management system (LIMS) on June 19, 2001 intact and in good condition. Chains of Custody (COC) Records are in order, unless otherwise noted in any attachments or Quality Assurance Notices. Sample ID's reported in this data package are noted by the receiving department on the COC if they differ from those listed by the samplers on the COC.

The samples were analyzed, in accordance with EPA - CLP Statement of Work (SOW) document ILM04.1 for CLP TAL dissolved metals.

The correlation coefficient for the mercury analytical run is confirmed to be $\geq$ 0.9950.

The cooler temperature bottle was present with samples received on June 19, 2001, and sample temperature was 4 degrees Celsius.

Five water samples were received for total metals and dissolved metals with the same Ids. Sample Ids were requested for the dissolved samples. The sample ID resolution is as follows:

MC0J36 for MC0013
MC0J37 for MC0014
MC0J38 for MC0015
MC0J39 for MC0016
MC0J40 for MC0017

EQUATIONS FOR WATER SAMPLE CALCULATIONS:

Client sample MC0J39 is used for illustration.

Any sample result that is $\leq$ the instrument detection limit (IDL) will be entered at the IDL for that analyte.

ICP Equation:

$$\text{ICP analyte, ug/L} = \frac{A \times D \times F}{B}$$

Where: A = ug/L (ppb) ICP analyte of sample from analysis
B = Liter of original sample for digestion (0.050 L)
D = any dilution factor necessary to bracket sample value within standard values
F = final sample solution volume (0.050 L)

Example: $\frac{57.00269 \text{ ppb(Al)} \times 1 \times 0.050 \text{ L}}{0.050 \text{ L}}$ = 57.00269 ppb reported as 57.0 ug/L of Al

Mercury Equation:

$$\text{Hg, ug/L} = \frac{A \times D \times F}{B}$$

Where: A = ug/L (ppb) Hg of sample from analysis
B = Liter of original sample for digestion (0.10 L)
D = any dilution factor necessary to bracket sample value within standard values
F = final sample solution volume (0.10 L)

Example: $\frac{0.10 \text{ ppb}^* \times 1 \times 0.10 \text{ L}}{0.10 \text{ L}}$ = 0.10 ppb reported as 0.10 ug/L* of Hg

* The result is reported down to the instrument detection limit.

SAMPLE IDs:

The following customer IDs are associated with this SDG:

MC0J36 MC0J37 MC0J38 MC0J39 MC0J40

INSTRUMENTAL QUALITY CONTROL:

All calibration verification solutions (ICV & CCV), blanks (ICB, & CCB), and interference check samples (ICSA & ICSAB) associated with this data were confirmed to be within EPA CLP allowable limits.

SAMPLE PREPARATION QUALITY CONTROL:

The sample preparation procedure verifications (LCSW & PBW) were found to be within acceptable ranges and all field samples were prepared and analyzed within the contract specified holding times.

MATRIX RELATED QUALITY CONTROL:

The sample matrix spike, CCN = WG10970-1 (MC0J39S) was found to be outside CLP control limits for silver. The reported concentration for this analyte is flagged with an "N" on all associated Form 1 and on Form 5a.

An "N" indicates a matrix-related interference in the sample preparation procedure &/or analysis for the flagged analyte. This is normally the consequence of a relatively high anionic content in the sample or (for some sediments) an inconsistent sample matrix relative to that analyte.

CLP control limits for matrix spike recoveries are set at 75% to 125% of the analyte quantity added unless original sample concentrations exceed the true values of these "spikes" by a factor of four or more. In this case, affected analytes are not flagged even if recoveries are outside percentage recovery control limits.

Post-digestion spikes are mandatory for analytes demonstrating unsatisfactory matrix spike recoveries during ICP analysis (excluding silver). The results of such spikes are presented on Form 5b.

Unsatisfactory recovery of post-digestion spikes of this type do not have bearing upon the aforementioned "N" flags, but may indicate interference during analysis &/or a solution matrix which is hostile to the analyte in question.

ORIGINAL

Satisfactory recovery of an analyte in a post-digestion spike of this type implies interference by the required preparation procedure or in the sample matrix itself. Lack of uniformity for an analyte in sediments will also result in satisfactory recovery of post-digestion spikes after failure in the related matrix spike.

The sample matrix duplicate, CCN = WG10970-2 (MC0J39D) was inside CLP control limits for the requested analytes.

CLP control limits for duplicate determinations are +/- 20% Relative Percent Difference (RPD) for concentrations greater than or equal to five times the CRDL in both the original and duplicate samples, and +/- the CRDL for concentrations less than five times the CRDL. The RPD is not calculated if both the original and duplicate values fall below the IDL.

A five-fold serial dilution of sample, CCN = MC0J36-4 (MC0J39L) was performed in accordance with CLP requirements for ICP analysis.

The adjusted sample concentrations were outside CLP control limits for potassium and sodium, which are flagged with an "E" on all associated Form 1, the Cover Page and Form 9.

An "E" indicates that a chemical or physical interference effect was encountered during the analysis of the flagged analyte. As a result of this interference, all values for the analyte in the same matrix must be considered to be estimated quantities.

CLP control limits for serial dilution are defined as a deviation less than or equal to 10% in the dilution-adjusted concentrations from the original values for all analyte concentrations with values greater than fifty (50) times their respective Instrument Detection Limit (IDL) in the original sample.

The laboratory manager or his designee, as verified by the following signature has authorized release of the data contained in this hard copy data package.

Thomas R. Cole
Data Reviewer II
June 28, 2001

CompuChem
a Division of Liberty Analytical Corp.
501 Madison Avenue Cary, NC 27513

ORIGINAL

DATA REPORTING QUALIFIERS FOR INORGANICS

On Form I, under the column labeled "C" for concentration qualifier and "Q" for qualifier, each result is flagged with the specific data reporting qualifiers listed below, as appropriate. Up to five qualifiers may be reported on Form I for each analyte.

The C (concentration) qualifiers used are:

U: This flag indicates the analyte was analyzed for but not detected. This reported value was obtained from a reading that was less than the Instrument Detection Limit (IDL). The IDL will be adjusted to reflect any dilution and, for soils, the percent moisture.

B: This flag indicates the analyte was analyzed for and the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL) but greater than or equal to the Instrument Detection Limit (IDL).

The Q qualifiers used are:

E: This flag indicates an estimated value. This flag is used:

1. When the serial dilution (a five fold dilution for CLP and a five fold dilution for SW-846 method 6010B) results are not within 10%. The analyte concentration must be sufficiently high (minimally a factor of 50X above the IDL in the original sample).
2. When the analytical spike recovery associated with the sample is below 40% after two successive dilutions by Graphite Furnace Atomic Absorption (GFAA).

M: This flag applies to GFAA analyses for concentrations greater than the Contract Required Detection Limit (CRDL). This flag is only used for GFAA if the analytical sample or analytical spike duplicate injection reading is not within 20% of the Relative Standard Deviation (RSD).

N: This flag indicates the sample spike recovery is outside of control limits:

***:** This flag is used for duplicate analysis when the sample and the sample duplicate results are not within control limits.

S: This flag applies to GFAA analyses to indicate the reported value was determined by the Method Of Standard Addition (MSA).

W: This flag applies to GFAA analyses when the post-digestion spike (analytical spike) is out of control limits (85% - 115%), while sample absorbance is less than 50% of "spike" absorbance ["spike" is defined as (absorbance or concentration of spike sample) minus (absorbance or concentration of the sample)].

+: This flag applies to GFAA analyses when the correlation coefficient for the MSA is less than 0.995 after two MSA analyses.

NOTE: Entering "S", "W", or "+" is mutually exclusive. No combination of these qualifiers can appear in the same field for an analyte.

The extensions: D, S, SD, L. A, added to the end of the client ID represent as follows:

D:	matrix duplicate
S:	matrix spike
SD:	matrix spike duplicate
L:	serial dilution
A:	post digestion spike

Method Codes:

P:	ICP PLASMA
CV:	MERCURY COLD VAPOR AA
CA:	MIDI-DISTILLATION SPECTROPHOTOMETRIC
F:	FURNACE AA

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ORIGINAL

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MC0J36

Lab Name: COMPUCHEM Contract: 68W00082

Lab Code: LIBRTY Case No.: 29424 SAS No.: SDG No.: MC0J36

Matrix (soil/water): WATER Lab Sample ID: MC0J36-1

Level (low/med): LOW Date Received: 06/19/01

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	40.8	B		P
7440-36-0	Antimony	1.6	U		P
7440-38-2	Arsenic	2.1	U		P
7440-39-3	Barium	42.5	B		P
7440-41-7	Beryllium	0.40	U		P
7440-43-9	Cadmium	0.30	U		P
7440-70-2	Calcium	18800			P
7440-47-3	Chromium	0.90	B		P
7440-48-4	Cobalt	0.30	U		P
7440-50-8	Copper	4.2	B		P
7439-89-6	Iron	175			P
7439-92-1	Lead	0.90	U		P
7439-95-4	Magnesium	6700			P
7439-96-5	Manganese	66.7			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	2.0	B		P
7440-09-7	Potassium	3210	B	E	P
7782-49-2	Selenium	2.3	U		P
7440-22-4	Silver	0.70	U	N	P
7440-23-5	Sodium	13200		E	P
7440-28-0	Thallium	3.5	U		P
7440-62-2	Vanadium	1.9	B		P
7440-66-6	Zinc	1.0	U		P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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INORGANIC ANALYSIS DATA SHEET

ORIGINAL

EPA SAMPLE NO.

MC0J37

Lab Name: COMPUCHEM Contract: 68W00082

Lab Code: LIBRTY Case No.: 29424 SAS No.: SDG No.: MC0J36

Matrix (soil/water): WATER Lab Sample ID: MC0J36-2

Level (low/med): LOW Date Received: 06/19/01

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	39.1	U		P
7440-36-0	Antimony	1.6	U		P
7440-38-2	Arsenic	2.1	U		P
7440-39-3	Barium	51.5	B		P
7440-41-7	Beryllium	0.40	U		P
7440-43-9	Cadmium	0.30	U		P
7440-70-2	Calcium	19400			P
7440-47-3	Chromium	1.2	B		P
7440-48-4	Cobalt	0.40	B		P
7440-50-8	Copper	4.8	B		P
7439-89-6	Iron	125			P
7439-92-1	Lead	0.90	U		P
7439-95-4	Magnesium	6940			P
7439-96-5	Manganese	64.7			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	1.6	B		P
7440-09-7	Potassium	3080	B	E	P
7782-49-2	Selenium	2.3	U		P
7440-22-4	Silver	0.70	U	N	P
7440-23-5	Sodium	13600		E	P
7440-28-0	Thallium	3.5	U		P
7440-62-2	Vanadium	2.2	B		P
7440-66-6	Zinc	1.1	B		P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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ORIGINAL

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MC0J38

Lab Name: COMPUCHEM Contract: 68W00082

Lab Code: LIBRTY Case No.: 29424 SAS No.: SDG No.: MC0J36

Matrix (soil/water): WATER Lab Sample ID: MC0J36-3

Level (low/med): LOW Date Received: 06/19/01

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	39.1	U		P
7440-36-0	Antimony	1.6	U		P
7440-38-2	Arsenic	2.1	U		P
7440-39-3	Barium	41.2	B		P
7440-41-7	Beryllium	0.40	U		P
7440-43-9	Cadmium	0.30	U		P
7440-70-2	Calcium	18300			P
7440-47-3	Chromium	1.3	B		P
7440-48-4	Cobalt	0.30	U		P
7440-50-8	Copper	4.5	B		P
7439-89-6	Iron	89.6	B		P
7439-92-1	Lead	0.90	U		P
7439-95-4	Magnesium	6630			P
7439-96-5	Manganese	59.4			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	1.9	B		P
7440-09-7	Potassium	3120	B	E	P
7782-49-2	Selenium	2.3	U		P
7440-22-4	Silver	0.70	U	N	P
7440-23-5	Sodium	13000		E	P
7440-28-0	Thallium	3.5	U		P
7440-62-2	Vanadium	1.8	B		P
7440-66-6	Zinc	1.0	U		P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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1

ORIGINAL

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MC0J39

Lab Name: COMPUCHEM Contract: 68W00082

Lab Code: LIBRTY Case No.: 29424 SAS No.: SDG No.: MC0J36

Matrix (soil/water): WATER Lab Sample ID: MC0J36-4

Level (low/med): LOW Date Received: 06/19/01

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	57.0	B		P
7440-36-0	Antimony	2.1	B		P
7440-38-2	Arsenic	2.1	U		P
7440-39-3	Barium	45.6	B		P
7440-41-7	Beryllium	0.40	U		P
7440-43-9	Cadmium	0.30	U		P
7440-70-2	Calcium	19000			P
7440-47-3	Chromium	1.4	B		P
7440-48-4	Cobalt	1.1	B		P
7440-50-8	Copper	4.1	B		P
7439-89-6	Iron	132			P
7439-92-1	Lead	0.90	U		P
7439-95-4	Magnesium	6980			P
7439-96-5	Manganese	63.9			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	2.8	B		P
7440-09-7	Potassium	3000	B	E	P
7782-49-2	Selenium	2.3	U		P
7440-22-4	Silver	0.70	U	N	P
7440-23-5	Sodium	13100		E	P
7440-28-0	Thallium	3.5	U		P
7440-62-2	Vanadium	3.0	B		P
7440-66-6	Zinc	1.0	U		P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

INORGANIC ANALYSIS DATA SHEET

ORIGINAL

EPA SAMPLE NO.: MC0J40

Lab Name: COMPUCHEM Contract: 68W00082

Lab Code: LIBRTY Case No.: 29424 SAS No.: SDG No.: MC0J36

Matrix (soil/water): WATER Lab Sample ID: MC0J36-5

Level (low/med): LOW Date Received: 06/19/01

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	39.1	U		P
7440-36-0	Antimony	1.6	U		P
7440-38-2	Arsenic	2.1	U		P
7440-39-3	Barium	0.12	B		P
7440-41-7	Beryllium	0.40	U		P
7440-43-9	Cadmium	0.30	U		P
7440-70-2	Calcium	11.3	U		P
7440-47-3	Chromium	0.92	B		P
7440-48-4	Cobalt	0.30	U		P
7440-50-8	Copper	0.90	U		P
7439-89-6	Iron	12.4	U		P
7439-92-1	Lead	0.90	U		P
7439-95-4	Magnesium	10.2	B		P
7439-96-5	Manganese	0.18	B		P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	0.95	B		P
7440-09-7	Potassium	28.9	U	E	P
7782-49-2	Selenium	2.3	U		P
7440-22-4	Silver	0.70	U	N	P
7440-23-5	Sodium	221	B	E	P
7440-28-0	Thallium	3.5	U		P
7440-62-2	Vanadium	0.30	U		P
7440-66-6	Zinc	1.0	U		P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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5A

SPIKE SAMPLE RECOVERY

ORIGINAL

EPA SAMPLE NO.: MC0J39S

Lab Name: COMPUCHEM Contract: 68W00082

Lab Code: LIBRTY Case No.: 29424 SAS No.: SDG NO.: MC0J36

Matrix (soil/water): WATER Level (low/med): LOW

% Solids for Sample: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum	75 - 125	2172.1331		57.0027	B	2000.00	105.8		P
Antimony	75 - 125	562.2483		2.1308	B	500.00	112.0		P
Arsenic	75 - 125	46.0278		2.1000	U	40.00	115.1		P
Barium	75 - 125	2306.4290		45.5522	B	2000.00	113.0		P
Beryllium	75 - 125	54.1662		0.4000	U	50.00	108.3		P
Cadmium	75 - 125	54.6790		0.3000	U	50.00	109.4		P
Chromium	75 - 125	222.5277		1.4433	B	200.00	110.5		P
Cobalt	75 - 125	552.3454		1.1029	B	500.00	110.2		P
Copper	75 - 125	291.3141		4.1090	B	250.00	114.9		P
Iron	75 - 125	1264.8700		132.4437		1000.00	113.2		P
Lead	75 - 125	20.4417		0.9000	U	20.00	102.2		P
Manganese	75 - 125	623.7799		63.8785		500.00	112.0		P
Mercury	75 - 125	0.9017		0.1000	U	1.00	90.2		CV
Nickel	75 - 125	551.1008		2.8028	B	500.00	109.6		P
Selenium	75 - 125	10.0209		2.3000	U	10.00	100.2		P
Silver	75 - 125	31.5746		0.7000	U	50.00	63.1	N	P
Thallium	75 - 125	49.7890		3.5000	U	50.00	99.6		P
Vanadium	75 - 125	561.8312		3.0146	B	500.00	111.8		P
Zinc	75 - 125	553.4832		1.0000	U	500.00	110.7		P

Comments: _____

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DUPLICATES

ORIGINAL

EPA SAMPLE NO.

MC0J39D

Lab Name: COMPUCHEM Contract: 68W00082

Lab Code: LIBRTY Case No.: 29424 SAS No.: SDG NO.: MC0J36

Matrix (soil/water): WATER Level (low/med): LOW

% Solids for Sample: 0.0 % Solids for Duplicate: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Aluminum		57.0027	B	39.1000	U	200.0		P
Antimony		2.1308	B	1.6000	U	200.0		P
Arsenic		2.1000	U	2.1000	U			P
Barium		45.5522	B	41.7843	B	8.6		P
Beryllium		0.4000	U	0.4000	U			P
Cadmium		0.3000	U	0.3000	U			P
Calcium	5000.0	19035.4004		19578.5391		2.8		P
Chromium		1.4433	B	2.8424	B	65.3		P
Cobalt		1.1029	B	0.3000	U	200.0		P
Copper		4.1090	B	4.5869	B	11.0		P
Iron	100.0	132.4437		148.2719		11.3		P
Lead		0.9000	U	0.9000	U			P
Magnesium	5000.0	6982.1440		7186.6230		2.9		P
Manganese	15.0	63.8785		65.5094		2.5		P
Mercury		0.1000	U	0.1000	U			CV
Nickel		2.8028	B	2.3407	B	18.0		P
Potassium		3001.4871	B	3019.0120	B	0.6		P
Selenium		2.3000	U	2.3000	U			P
Silver		0.7000	U	0.7000	U			P
Sodium	5000.0	13126.2695		13493.8896		2.8		P
Thallium		3.5000	U	3.5000	U			P
Vanadium		3.0146	B	1.9206	B	44.3		P
Zinc		1.0000	U	1.0000	U			P

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LABORATORY CONTROL SAMPLE

ORIGINAL

Lab Name: COMPUCHEM Contract: 68W00082

Lab Code: LIBRTY Case No.: 29424 SAS No.: SDG NO.: MC0J36

Solid LCS Source:

Aqueous LCS Source: HIPUR

Analyte	Aqueous (ug/L) True	Found	%R	Solid (mg/kg) True	Found	C	Limits		%R
Aluminum	20000.0	21486.08	107.4						
Antimony	6000.0	6447.28	107.4						
Arsenic	1000.0	1029.63	103.0						
Barium	20000.0	21238.33	106.2						
Beryllium	500.0	495.11	99.0						
Cadmium	500.0	502.98	100.6						
Calcium	50000.0	51336.71	102.7						
Chromium	1000.0	1024.61	102.5						
Cobalt	5000.0	5067.82	101.4						
Copper	2500.0	2744.52	109.8						
Iron	10000.0	10488.93	104.9						
Lead	300.0	302.55	100.8						
Magnesium	50000.0	51446.11	102.9						
Manganese	1500.0	1538.21	102.5						
Nickel	4000.0	4073.07	101.8						
Potassium	50000.0	54089.75	108.2						
Selenium	500.0	512.72	102.5						
Silver	1000.0	1088.72	108.9						
Sodium	50000.0	52426.63	104.8						
Thallium	1000.0	1043.44	104.3						
Vanadium	5000.0	5172.37	103.4						
Zinc	2000.0	2070.98	103.5						